

WHAT IS CLAIMED IS:

1 1. A device for percutaneously exposing an outer layer of a body lumen
2 or body cavity of a patient which is covered by an inner layer comprising:
3 a catheter body having a proximal end, a distal end and a lumen therethrough;
4 and
5 a dissection tool disposed near the distal end of the catheter body adapted to
6 expose a portion of the outer layer.

1 2. A device as in claim 1, wherein the body lumen comprises a blood
2 vessel, the inner layer comprises an intimal layer, and the outer layer comprises an adventitial
3 layer.

1 3. A device as in claim 2, wherein the dissection tool comprises a radially
2 expansive element configured to contact the vessel wall in an expanded position.

1 4. A device as in claim 3, wherein the radially expansive element
2 comprises a cutting surface configured to cut through the intimal layer of the vessel wall to
3 expose a portion of the adventitial layer after contact with the vessel wall in the expanded
4 position.

1 5. A device as in claim 4, wherein the cutting surface is configured to cut
2 by rotation of the radially expansive element.

1 6. A device as in claim 3, wherein the radially expansive element
2 comprises an abrasive surface configured to abrade an intimal layer of the vessel wall to
3 expose a portion of the adventitial layer after contact with the vessel wall in the expanded
4 position.

1 7. A device as in claim 6, wherein the abrasive surface is configured to
2 abrade by rotation of the radially expansive element.

1 8. A device as in claim 3, wherein the radially expansive element is
2 advanceable along the exposed portion of the adventitial layer to delaminate the intimal layer
3 from the adventitial layer along a segment of the blood vessel.

3 adhesive surface adapted to adhere to an intimal layer of the vessel wall upon contact with the
4 vessel wall.

1 20. A device as in claim 19, wherein the adhesive element is capable of
2 removing the adhered portions of the intimal layer from the vessel wall to expose portions of
3 the adventitial layer upon withdrawal of the adhesive element.

1 21. A device as in claim 19, wherein the adhesive surface comprises a
2 vacuum suction.

1 22. A device as in claim 20, wherein the adhesive surface comprises
2 cyanoacrylate, UV curable adhesive, epoxy, bioadhesives, and collagen based adhesives.

1 23. A device as in claim 19, wherein the adhesive surface comprises a
2 material having a temperature in the range of approximately -100°C to 0°C.

1 24. A device as in claim 19, wherein the adhesive surface comprises a
2 material having a temperature in the range of approximately 42°C to 100°C.

1 25. A device as in claim 2, further comprising a stripping tool adapted to
2 be received within the catheter body lumen, said stripping tool comprising a stripping
3 component configured to contact the exposed portion of the adventitial layer and advance
4 along the exposed portion to delaminate the intimal layer from the adventitial layer along a
5 segment of the blood vessel.

1 26. A device as in claim 25, wherein the stripping tool further comprises a
2 shaft having a proximal end, a distal end and a threaded surface along at least a portion of its
3 length, wherein the stripping component is mounted on the shaft so that rotation of the shaft
4 advances the stripping component along the shaft.

1 27. A device as in claim 26, wherein the stripping component is mounted
2 on the shaft so that rotation of the shaft linearly advances the stripping component along the
3 shaft without rotating the stripping component.

1 28. A device as in claim 25, wherein the stripping component comprises a
2 radially expansible ring positionable between the intimal and adventitial layers so that the
3 intimal layer passes through the inside of the ring during advancement.

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1 29. A device as in claim 28, wherein the catheter further comprises an
2 aspiration lumen and the stripping component further comprises a funnel shaped dissection
3 propagator connected to the ring to guide the delaminated intimal layer into the aspiration
4 lumen.

1 30. A device as in claim 29, wherein the catheter further comprises a
2 macerating element within the aspiration lumen and/or dissection propagator to macerate the
3 delaminated intimal layer.

1 31. A device as in claim 25, wherein the stripping component comprises at
2 least one radially expandable arm having a blunt-end tip configured to be positionable
3 between the intimal and adventitial layers so that the intimal layer is delaminated as the
4 stripping component is retracted.

1 32. A device as in claim 25, wherein the stripping component comprises a
2 radially expansible coil positionable between the intimal and adventitial layers so that the
3 intimal layer passes through the inside of the coil during advancement.

1 33. A device as in claim 32, wherein the coil has an oblique angle formed
2 leading edge and the coil is advanceable by rotation.

1 34. A device as in claim 25, further comprising a mechanical pump
2 adapted to be received within the catheter body lumen.

1 35. A device as in claim 34, further comprising a macerating element
2 located at least partially along the length of said mechanical pump.

1 36. A device as in claim 25, wherein the stripping component comprises a
2 rod having an atraumatic distal tip, the rod being angularly extendable from the catheter body
3 and the tip being configured to be positionable between the intimal and adventitial layers.

1 37. A device as in claim 36, wherein the rod is rotatable around a
2 longitudinal axis of the catheter body.

1 38. A device as in claim 36, wherein the rod is angularly and/or extendably
2 adjustable.

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1 39. A device as in claim 25, wherein the stripping component comprises an
2 inflatable member.

1 40. A device as in claim 39, wherein the stripping component further
2 comprises an angioscope disposed within the inflatable member for visualization of the
3 delamination process.

1 41. A device as in claim 39, wherein the stripping tool further comprises
2 an anchoring component configured to contact the vessel wall near the exposed portion of the
3 adventitial layer and remain fixed in place during advancement of the stripping component.

1 42. A device as in claim 41, wherein the anchoring component comprises
2 an inflatable member configured to overexpand the blood vessel.

1 43. A device as in claim 25, wherein the stripping tool further comprises:
2 a shaft having a proximal end and a distal end, wherein the stripping
3 component is disposed therebetween;

4 a proximal occlusion member mounted on the shaft proximal to the stripping
5 component;

6 a distal occlusion member mounted on the shaft distal to the stripping
7 component; and

8 an angioscope and light source disposed between the occlusion members,
9 wherein the occlusion members are capable of isolating a section of the vessel
10 that is fillable with saline for visualization of the delamination by the angioscope during
11 advancement of the stripping component.

1 44. A device as in claim 2, further comprising a stripping tool adapted to
2 be received within the catheter body lumen, said stripping tool comprising a stripping
3 component configured to be inserted between the intimal and adventitial layers and to be
4 rotated around a longitudinal axis of the catheter body to delaminate the intimal layer from
5 the adventitial layer along a segment of the blood vessel.

1 45. A device as in claim 2, wherein the dissection tool is configured to
2 advance along the exposed portion to delaminate the intimal layer from the adventitial layer
3 along a segment of the blood vessel.

46. A device as in claim 2, further comprising a cutting tool adapted to be received within the catheter body lumen, said cutting tool comprising a ring configured to be advanceable along a cleavage plane between a delaminated intimal layer and the adventitial layer.

47. A device as in claim 46, wherein the ring comprises a support tube and a cutting wire, wherein the support tube is retractable to expose the cutting wire which is configured to cut through the delaminated intimal layer when tensioned.

48. A device for percutaneously exposing an outer layer of a body lumen or body cavity of a patient which is covered by an inner layer comprising:
a catheter body having a proximal end, a distal end, and a lumen therethrough;
and
a dissection means disposed near the distal end of the catheter body for exposing a portion of the outer layer.

49. A device as in claim 48, further comprising a stripping means adapted to be received within the catheter body lumen for delaminating the inner layer from the outer layer.

50. A device as in claim 49, further comprising a cutting means adapted to be received within the catheter body for cutting through and releasing the delaminated inner layer.

51. A device for percutaneously delaminating an inner layer of a body lumen of a patient from an outer layer comprising:
a catheter body having a proximal end, a distal end, and a lumen therethrough;
and
means mounted on the catheter body for elongating a segment of the body lumen to cause delamination of the inner layer from the outer layer.

52. A device as in claim 51, wherein the means for elongating comprises a proximal occlusion member and a distal occlusion member which are capable of moving apart thereby elongating the segment.

3 vessel wall, the adhesive surface adapted to adhere to an intimal layer of the vessel wall upon
4 contact with the vessel wall.

1 60. A system as in claim 59, wherein the adhesive element removes the
2 adhered portions of the intimal layer from the vessel wall to expose portions of the adventitial
3 layer upon withdrawal of the adhesive element.

1 61. A system as in claim 59, wherein the adhesive surface comprises a
2 vacuum suction.

1 62. A system as in claim 56, wherein the stripping tool comprises a
2 stripping component comprising a radially expansible ring positionable between the intimal
3 and adventitial layers so that the intimal layer passes through the inside of the ring during
4 advancement.

63. A system as in claim 56, wherein the stripping catheter further comprises body lumen and a mechanical pump adapted to be received within the body lumen.

1 64. A system as in claim 63, further comprising a macerating element
2 located at least partially along the length of the mechanical pump.

65. A method of percutaneously removing an occlusion from a site within
blood vessel of a patient comprising the following steps:
providing a catheter having a proximal end, a distal end, a lumen therethrough,
and a dissection tool disposed near the distal end;
introducing the catheter into the vessel and advancing the dissection tool to the
site of the occlusion to be treated; and
contacting the vessel wall near the site with the dissection tool to expose a
portion of an adventitial layer.

1 66. A method as in claim 65, wherein the dissection tool comprises a
2 radially expansive element and the contacting step further comprises radially expanding the
3 element so that the element contacts the vessel wall.

67. A method as in claim 66, wherein the radially expansive element has a cutting surface and the radial expansion disposes the cutting surface against the vessel wall to cut through the intimal layer and expose the portion of the adventitial layer.

1 76. A method as in claim 75, wherein the stripping tool comprises a shaft
2 having a proximal end, a distal end, and a threaded surface along at least a portion of its
3 length wherein the stripping component is mounted on the shaft in a locked position, and the
4 method further comprises rotating the shaft which advances the stripping component along
5 the segment of the blood vessel.

1 77. A method as in claim 75, wherein the stripping component comprises a
2 radially expandible ring, and the method further comprises positioning the ring between the
3 intimal and adventitial layers so that the intimal layer passes through the inside of the ring
4 during advancement.

1 78. A method as in claim 77, wherein the ring comprises a support tube
2 and a cutting wire and the method further comprises:
3 retracting the support tube to expose the cutting wire; and
4 tensioning the cutting wire to cut through the intimal tissue and release the
5 delaminated intimal tissue from the vessel wall.

1 79. A method as in claim 78, further comprising macerating the
2 delaminated intimal tissue and removing the tissue through an aspiration lumen in the
3 catheter.

1 80. A method as in claim 75, wherein the stripping component comprises a
2 radially expandible coil, and the method further comprises positioning the coil between the
3 intimal and adventitial layers so that the intimal layer passes through the inside of the coil
4 during advancement.

1 81. A method as in claim 80, further comprising advancing the coil by
2 rotation.

1 82. A method as in claim 75, further comprising macerating the
2 delaminated intimal tissue and removing the tissue through an aspiration lumen in the
3 catheter.

1 83. A method as in claim 75, wherein the stripping component comprises a
2 rod having an atraumatic tip, and the method further comprises angularly extending the rod
3 from the catheter body and positioning the tip between the intimal and adventitial layers.

1 90. A kit as in claim 88, further comprising an aspiration catheter.

1 91. A kit as in claim 88, further comprising an adhesive material for
2 application to an adhesive surface.

1 92. A system for percutaneously treating a body lumen or body cavity of a
2 patient having an inner layer covered by an outer layer comprising:

3 a dissection catheter having a proximal end, a distal end and a dissection tool
4 disposed near the distal end adapted to expose a portion of the inner layer; and

5 a stripping catheter having a proximal end, a distal end and a stripping tool
6 disposed near the distal end adapted to contact the exposed portion of the inner layer and
7 advance along the exposed portion to delaminate the outer layer from the inner layer along a
8 segment of the body lumen.

1 93. A method of percutaneously treating a target location within a body
2 lumen of a patient having an inner layer covered by an outer layer comprising the following
3 steps:

4 providing a catheter having a proximal end, a distal end, a lumen therethrough,
5 and a dissection tool disposed near the distal end;

6 introducing the catheter into the body lumen and advancing the dissection tool
7 near the target location; and

8 contacting the outer layer near the target location with the dissection tool to
9 expose a portion of the underlying inner layer.

1 94. A kit for percutaneously treating a target location within a body lumen
2 or body cavity of a patient having an inner layer covered by an outer layer comprising:

3 a percutaneous catheter having a proximal end, a distal end, a lumen
4 therethrough and a dissection tool disposed near the distal end adapted to expose a portion of
5 the inner layer; and

6 instructions for use including the following methods:

7 introducing the catheter into the vessel and advancing the dissection tool to the
8 target location; and

9 contacting the outer layer with the dissection tool to expose a portion of the
10 inner layer.